

What Is Claimed Is:

1. A data processing system comprising:
a first storage system communicably connected to a host unit; and

a second storage system and a third storage system each communicably connected to said first storage system, wherein:

(1) said first storage system comprises:

a first data storage area for storing data transmitted from the host unit;

a first journal storage area for storing a journal used for producing a copy of data stored in said first storage area; and

a first control unit which writes the data transmitted from said host unit into said first data storage area, writes the journal of the data written into said first data storage area into said first journal storage area, and transmits said journal present in said first journal storage area to each of said second and third storage systems in response to a request from each of said second and third storage systems;

(2) said second storage system comprises:

a second data storage area for storing a copy of the data present in said first data storage area;

a second journal storage area for storing said journal; and

a second control unit which reads said journal from said first storage system at an independently scheduled journal read timing, writes the read-out journal into said second journal storage area, produces a copy of the data present in said first data storage area based on said journal present in said second journal storage area at an independently scheduled restore timing, and writes the copy into said second data storage area; and

(3) said third storage system comprises:

a third data storage area for storing a copy of the data present in said first data storage area;

a third journal storage area for storing said journal; and

a third control unit which reads said journal from said first storage system at an independently scheduled journal read timing, writes the read-out journal into said third journal storage area, produces a copy of the data present in said first data storage area based on said journal present in said third journal storage area at an independently scheduled restore timing, and writes the copy into said third data storage area, and

said first control unit of said first storage system detects as to whether or not said journal present in said first journal storage area has been read by said second and

third storage systems, holds said journal present in said first journal storage area till the journal is read by both said second and third storage systems, and can delete said journal present in said first journal storage area after the journal has been read by both said second and third storage systems.

2. The data processing system according to claim 1, wherein

(1) said first storage system comprises:

a plurality of physical storage units;

said first control unit of said first storage system comprises a host adapter for exchanging data with said host device, a disk adapter for exchanging data with said plurality of physical storage units, and a cache memory for storing the data received by said host adapter and the data received by said disk adapter; and

said first control unit allocates the storage areas held by said plurality of physical storage units in said first storage system to said first data storage area and said first journal storage area;

(2) said first storage system comprises:

a plurality of physical storage units;

said second control unit of said second storage system comprises a host adapter for exchanging data with said first storage system, a disk adapter for exchanging data with

said plurality of physical storage units, and a cache memory for storing the data received by said host adapter and the data received by said disk adapter; and

said second control unit allocates the storage areas held by said plurality of physical storage units in said second storage system to said second data storage area and said second journal storage area; and

(3) said third storage system comprises:

a plurality of physical storage units;

said third control unit of said third storage system comprises a host adapter for exchanging data with said first storage system, a disk adapter for exchanging data with said plurality of physical storage units, and a cache memory for storing the data received by said host adapter and the data received by said disk adapter; and

said third control unit allocates the storage areas held by said plurality of physical storage units in said third storage system to said third data storage area and said third journal storage area.

3. The data processing system according to claim 1, wherein

said third control unit of said third storage system controls the time interval of said journal read according to the number of data in the journal that has been read from said first journal storage area.

4. The data processing system according to claim 1, wherein

said third control unit of said third storage system controls the time interval of said journal read according to the communication quantity of data exchanged between said first storage system and said third storage system.

5. The data processing system according to claim 1, wherein

said third control unit of said third storage system controls the time interval of said journal read according to the storage capacity of said journal held in said third data storage area.

6. The data processing system according to claim 1, wherein

said third control unit of said third storage system controls the time interval of said journal read according to the processing load of said third storage system.

7. The data processing system according to claim 1, wherein

said third control unit of said third storage system reads from said first storage system information relating to the storage capacity of said journal held in said first journal storage area in said first storage system and controls

the time interval of said journal read according to the information relating to the storage capacity of said journal that was read out.

8. The data processing system according to claim 1, wherein

said first storage system owns management information relating to said first journal storage area; and

said third control unit of said third storage system reads from said first storage system the management information relating to said first journal storage area, which is owned by the first storage system, and controls the time interval of said journal read according to the management information relating to said first journal storage area that was read out.

9. The data processing system according to claim 1, wherein

said first data storage area in said first storage system has a plurality of logical volumes;

said first control unit writes into said first journal storage area a plurality of journals each corresponding to a plurality of data stored in said plurality of logical volumes;

information relating to an update sequence of said plurality of data, each corresponding to said plurality of

journals, is contained in said plurality of journals stored in said first journal storage area; and

each of the second and third control units of said second and third storage systems produces copies of said plurality of data based on said plurality of journals according to said update sequence contained in said plurality of journals read out from said first storage system and writes those copies in respective said second and third data storage areas.

10. The data processing system according to claim 1, wherein

said third storage system controls said restore timing according to the processing load of said third storage system.

11. A data processing system comprising:

a first storage system communicably connected to a host unit; and

a second storage system and a third storage system each communicably connected to said first storage system, wherein:

(1) said first storage system comprises:

a first data storage area for storing data transmitted from the host unit;

a first journal storage area for storing a journal used for producing a copy of data stored in said first storage area; and

a first control unit which writes the data transmitted from said host unit into said first data storage area and writes the journal of the data thus written into said first journal storage area;

(2) said second storage system comprises:

a second journal storage area for storing said journal; and

a second control unit which reads said journal from said first storage system at a prescribed journal read timing and writes the read-out journal into said second journal storage area; and

(3) said third storage system comprises:

a third journal storage area for storing said journal; and

a third control unit which reads said journal from said first storage system at a prescribed journal read timing and writes the read-out journal into said third journal storage area.

12. The data processing system according to claim 11, wherein

said second storage system further comprises a second data storage area for storing a copy of said data, and

said second control unit produces a copy of said data from said journal stored in said second journal storage area at a prescribed restore timing and writes the produced copies of said data into said second data storage area; and

said third storage system further comprises a third data storage area for storing a copy of said data, and said third control unit produces a copy of said data from said journal stored in said third journal storage area at a prescribed restore timing and writes the produced copies of said data into said third data storage area.

13. The data processing system according to claim 11, wherein

said first control unit of said first storage system detects as to whether or not said journal present in said first journal storage area has been read by said second and third storage systems, holds said journal present in said first journal storage area till the journal is read by both said second and third storage systems, and can delete said journal present in said first journal storage area after the journal has been read by both said second and third storage systems.

14. The data processing system according to claim 11, wherein

said third control unit of said third storage system controls the time interval of said journal read according to the number of data in the journal that has been read from said first journal storage area.

15. The data processing system according to claim 11, wherein

said third control unit of said third storage system controls the time interval of said journal read according to the communication quantity of data exchanged between said first storage system and said third storage system.

16. The data processing system according to claim 11, wherein

said third control unit of said third storage system controls the time interval of said journal read according to the storage capacity of said journal held in said third data storage area.

17. The data processing system according to claim 11, wherein

said third control unit of said third storage system controls the time interval of said journal read according to the processing load of said third storage system.

18. The data processing system according to claim 11, wherein

said third control unit of said third storage system reads from said first storage system information relating to the storage capacity of said journal held in said first journal storage area in said first storage system and controls the time interval of said journal read according to the information relating to the storage capacity of said journal that was read out.

19. The data processing system according to claim 11, wherein

said first storage system owns management information relating to said first journal storage area; and

said third control unit of said third storage system reads from said first storage system the management information relating to said first journal storage area, which is owned by the first storage system, and controls the time interval of said journal read according to the management information relating to said first journal storage area that was read out.